MULTIMEDIA ![logo] UNIVERSITY STUDENT ID NO

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|

# MULTIMEDIA UNIVERSITY

# FINAL EXAMINATION

TRIMESTER 1, 2016/2017

## BFN3174 – FINANCIAL MODELING
(All sections / Groups)

12 October 2016
2.30 p.m – 4.30 p.m.
(2 Hours)

---

**INSTRUCTIONS TO STUDENT**

1. This question paper consists of **SEVEN** pages (excluding this cover page).

2. Answer <u>**ALL FOUR**</u> questions in **FOUR SEPARATE** Excel spreadsheets in **ONE SINGLE** Excel file.

3. Your Excel file should be named with your **STUDENT ID**, followed by your **NAME**, for example: **1111111623_HISHAM.xls**

4. **SAVE** your answers for all questions in the provided **THUMB-DRIVE.**

## QUESTION 1 (25 MARKS)

Alex just turned 55. Alex is planning to retire in 10 years, and he currently has RM500,000 in his pension fund. Based on the longevity pattern of his family, he assumes that he will live 20 years past his retirement date. During each of these years he desires to withdraw RM200,000 from his pension fund. If the interest rate is 5% per year, how much will Alex have to save annually for the next 10 years? Assume that the first deposit to his pension fund will be today, followed by nine more annual deposits, and that the annual withdrawals from age 65 will occur at the beginning of each year.

a.    Using the following template to model the above problem.

| | A | B | C | D | E | F | G |
|---|---|---|---|---|---|---|---|
| 1 | INPUT ZONE | | | | | | |
| 2 | Annual desired withdrawal from the pension fund (RM) | | | | | | |
| 3 | Annual payment (RM) | | | | | | |
| 4 | Annual Interest rate | | | | | | |
| 5 | Current balance of the pension fund (RM) | | | | | | |
| 6 | | | | | | | |
| 7 | MODELING ZONE | | | | | | |
| 8 | Your age | Account balance, beginning of year | Deposit or withdrawal beginning of year | Interest earned during year | Total in account end of year | | |
| 9 | 55 | | | | | | |
| 10 | 56 | | | | | | |
| 11 | 57 | | | | | | |
| 12 | 58 | | | | | | |
| 13 | 59 | | | | | | |
| 14 | 60 | | | | | | |
| 15 | 61 | | | | | | |
| 16 | 62 | | | | | | |
| 17 | 63 | | | | | | |
| 18 | 64 | | | | | | |
| 19 | 65 | | | | | | |
| 20 | 66 | | | | | | |
| 21 | 67 | | | | | | |
| 22 | 68 | | | | | | |
| 23 | 69 | | | | | | |
| 24 | 70 | | | | | | |
| 25 | 71 | | | | | | |

| | A | B | C | D | E | F | G |
|---|---|---|---|---|---|---|---|
| 25 | 71 | | | | | | |
| 26 | 72 | | | | | | |
| 27 | 73 | | | | | | |
| 28 | 74 | | | | | | |
| 29 | 75 | | | | | | |
| 30 | 76 | | | | | | |
| 31 | 77 | | | | | | |
| 32 | 78 | | | | | | |
| 33 | 79 | | | | | | |
| 34 | 80 | | | | | | |
| 35 | 81 | | | | | | |
| 36 | 82 | | | | | | |
| 37 | 83 | | | | | | |
| 38 | 84 | | | | | | |
| 39 | | | | | | | |
| 40 | | | | | | | |

(20 marks)

Continued...

b.   Solve the above problem using function PV and PMT with the template below.

| | A | B |
|---|---|---|
| 1 | INPUT ZONE | |
| 2 | Pension savings today | |
| 3 | Annual desired pension payout | |
| 4 | Number of years until retirement | |
| 5 | Number of payout years after retirement | |
| 6 | Interest rate | |
| 7 | | |
| 8 | MODELING ZONE | |
| 9 | Present value today of all future retirement payments | |
| 10 | Annual payment until retirement | |
| 11 | | |

## QUESTION 2 (25 MARKS)                                              (5 marks)

On 20 February 2011, you are offered a US Treasury note. Here are the terms of the note:

-   The note has a face value of $100,000 and 8% coupon rate. The note matures on 15 October 2016.

-   The semi-annual interest on the note is paid on 15 April and 15 October of each year.

-   The last interest payment was 15 October 2010 and the next interest payment is on 15 April 2011.

-   Other interest payments are on 15 October 2011, 15 April 2012, ..., 15 October 2016. On this last date of the bond's principal of $100,000 is also returned.

-   On 20 February 2011, the quoted bond price is $105,000.

Using the provided template below to model the following questions:

a.   Calculate the accrued interest for the bond.

b.   Compute the actual bond price.                                  (8 marks)
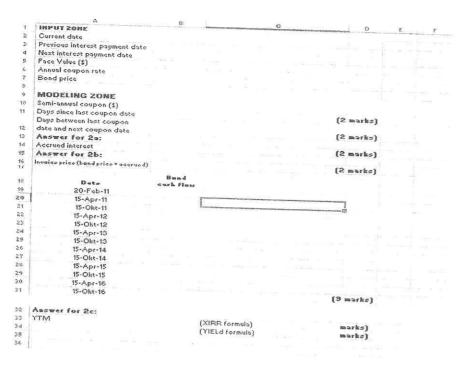
                                                                     (9 marks)

c.   Use XIRR and YIELD functions in Microsoft Excel to calculate the annualized yield to maturity (YTM).

                                                                     (8 marks)

                                                                     Continued...

|  | A | B | C | D | E | F |
|---|---|---|---|---|---|---|
| 1 | INPUT ZONE | | | | | |
| 2 | Current date | | | | | |
| 3 | Previous interest payment date | | | | | |
| 4 | Next interest payment date | | | | | |
| 5 | Face Value ($) | | | | | |
| 6 | Annual coupon rate | | | | | |
| 7 | Bond price | | | | | |
| 8 | | | | | | |
| 9 | MODELING ZONE | | | | | |
| 10 | Semi-annual coupon ($) | | | | | |
| 11 | Days since last coupon date | | | | | |
| 12 | Days between last coupon date and next coupon date | | (2 marks) | | | |
| 13 | Answer for 2a: | | (2 marks) | | | |
| 14 | Accrued interest | | | | | |
| 15 | Answer for 2b: | | (2 marks) | | | |
| 16 | Invoice price (bond price + accrued) | | (2 marks) | | | |
| 17 | | | | | | |
| 18 | Date | Bond cash flow | | | | |
| 19 | 20-Feb-11 | | | | | |
| 20 | 15-Apr-11 | | | | | |
| 21 | 15-Okt-11 | | | | | |
| 22 | 15-Apr-12 | | | | | |
| 23 | 15-Okt-12 | | | | | |
| 24 | 15-Apr-13 | | | | | |
| 25 | 15-Okt-13 | | | | | |
| 26 | 15-Apr-14 | | | | | |
| 27 | 15-Okt-14 | | | | | |
| 28 | 15-Apr-15 | | | | | |
| 29 | 15-Okt-15 | | | | | |
| 30 | 15-Apr-16 | | | | | |
| 31 | 15-Okt-16 | | (9 marks) | | | |
| 32 | Answer for 2c: | | | | | |
| 33 | YTM | | | | | |
| 34 | | (XIRR formula) | marks) | | | |
| 35 | | (YIELd formula) | marks) | | | |
| 36 | | | | | | |

## QUESTION 3 (25 MARKS)

Considering the following data concerning ABC Company. ABC's stock is not currently listed on a stock exchange.

- Expected return for the market portfolio, $E(r_M) = 10\%$
- Cost of debt, $r_D = 8\%$
- Corporate tax rate, $T_c = 30\%$
- Covariance between ABC stock prices and market portfolio index prices, $Cov(r_{ABC}, r_M) = 0.1$
- Value of debt, $D = RM2,000,000$
- Risk free rate, $r_f = 4\%$
- Variance for the market portfolio, $Var(r_M) = 0.2$
- Value of equity, $E = RM2,000,000$

Using the template below to model:

a.      the cost of equity for ABC.

(8 marks)

b.      the weighted average cost of capital (WACC) for ABC.

(6 marks)

Continued...

c.  Suppose ABC issues its stocks in an initial public offering (IPO). After the IPO the company has 3,000,000 shares, worth RM10 each. Model the WACC for ABC after the IPO?

(9 marks)

| | A | B | C | D | E |
|---|---|---|---|---|---|
| 1 | INPUT ZONE | | | | |
| 2 | $E(r_H)$ | | | | |
| 3 | $r_D$ | | | | |
| 4 | $T_c$ | | | | |
| 5 | $Cov(r_{ABC}, r_H)$ | | | | |
| 6 | D | | | | |
| 7 | $Var(r_H)$ | | | | |
| 8 | $r_f$ | | | | |
| 9 | Value of Equity E before the IPO | | | | |
| 10 | Share Price | | | | |
| 11 | Number of Shares | | | | |
| 12 | | | | | |
| 13 | MODELLING ZONE | | | | |
| 14 | A. Finding the company cost of equity. | | | | |
| 15 | β | | | | |
| 16 | $r_E$ | | (4 marks) | | |
| 17 | | | (4 marks) | | |
| 18 | B. Finding the company WACC. | | | | |
| 19 | | | | | |
| 20 | V=D+E | | | | |
| 21 | WACC | | (3 marks) | | |
| 22 | | | (4 marks) | | |
| 23 | C. WACC after the IPO | | | | |
| 24 | | | | | |
| 25 | Value of Equity after the IPO | | | | |
| 26 | V=D+E | | (3 marks) | | |
| 27 | WACC | | (3 marks) | | |
| 28 | | | (4 marks) | | |

## QUESTION 4 (25 MARKS)

a.  Using the Black-Scholes model, model the price of a call option on a stock with the template provided below. Details of the stock are:

- Current stock price, (S) = 20
- Exercise price, (X) = 15
- Time to maturity, (T) = 0.5
- Interest rate, (r) = 3%
- Standard deviation, (sigma) = 50%.

(10 marks)

Continued...

b.      Using the following templates to produce data tables and graphs that show:

(i)     the sensitivity of the Black-Scholes call price to changes in the initial stock price (S).

**(5 marks)**

(ii)    the sensitivity of the Black-Scholes call price to changes in the exercise price (X).

**(5 marks)**

(ii)    the sensitivity of the Black-Scholes call price to changes in the volatility of the stock prices (sigma).

**(5 marks)**

| | A | B | C | D |
|---|---|---|---|---|
| 1 | **Input Zone** | | | |
| 2 | S | | | |
| 3 | K | | | |
| 4 | r | | | |
| 5 | T | | | |
| 6 | Sigma | | | |
| 7 | | | 1 mark | |
| 8 | **Modelling Zone** | | | |
| 9 | Step 1: | | | |
| 10 | $d_1$ | | | |
| 11 | $d_2$ | | 1 mark | |
| 12 | | | 1 mark | |
| 13 | Step 2: | | | |
| 14 | $N(d_1)$ | | | |
| 15 | $N(d_2)$ | | 2 mark | |
| 16 | $N(-d1)$ | | 2 mark | |
| 17 | $N(-d2)$ | | 1 mark | |
| 18 | | | 1 mark | |
| 19 | Step 3: | | | |
| 20 | Call price | | | |
| | | | 2 mark | |

Continued...

| | A<br>Stock Price | B<br>Call Option Price |
|---|---|---|
| 28 | | |
| 29 | | |
| 30 | 1 | 0.00 |
| 31 | 2 | |
| 32 | 3 | |
| 33 | 4 | |
| 34 | 5 | |
| 35 | 6 | |
| 36 | 7 | |
| 37 | 8 | |
| 38 | 9 | |
| 39 | 10 | |
| 40 | 11 | |
| 41 | 12 | |
| 42 | 13 | |
| 43 | 14 | |
| 44 | 15 | |
| 45 | 16 | |
| 46 | 17 | |
| 47 | 18 | |
| 48 | 19 | |
| 49 | 20 | |
| 50 | | |

| | A<br>Exercise Price | B<br>Call Option Price | D |
|---|---|---|---|
| 53 | | | |
| 54 | | | |
| 55 | 1 | 0.00 | |
| 56 | 2 | | |
| 57 | 3 | | |
| 58 | 4 | | |
| 59 | 5 | | |
| 60 | 6 | | |
| 61 | 7 | | |
| 62 | 8 | | |
| 63 | 9 | | |
| 64 | 10 | | |
| 65 | 11 | | |
| 66 | 12 | | |
| 67 | 13 | | |
| 68 | 14 | | |
| 69 | 15 | | |
| 70 | 16 | | |
| 71 | 17 | | |
| 72 | 18 | | |
| 73 | 19 | | |
| 74 | 20 | | |

Continued...

| | A | B |
|---|---|---|
| 78 | Standard Deviation | Call Option Price |
| 79 | | |
| 80 | 0.05 | 0.00 |
| 81 | 0.10 | |
| 82 | 0.15 | |
| 83 | 0.20 | |
| 84 | 0.25 | |
| 85 | 0.30 | |
| 86 | 0.35 | |
| 87 | 0.40 | |
| 88 | 0.45 | |
| 89 | 0.50 | |
| 90 | 0.55 | |
| 91 | 0.60 | |
| 92 | 0.65 | |
| 93 | 0.70 | |
| 94 | 0.75 | |
| 95 | 0.80 | |
| 96 | 0.85 | |
| 97 | 0.90 | |
| 98 | 0.95 | |
| 99 | 1.00 | |
| 100 | | |

**End of Page**